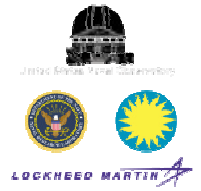


# Spacecraft Bus to Instrument Interfaces



# Mechanical/Thermal Interface

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# Top Level Requirements



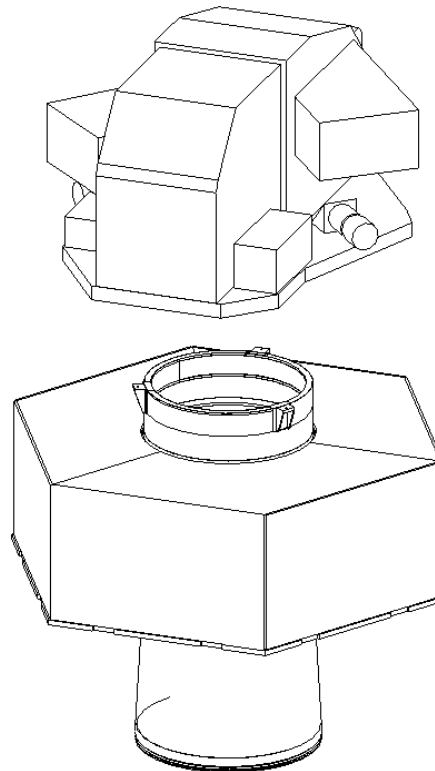
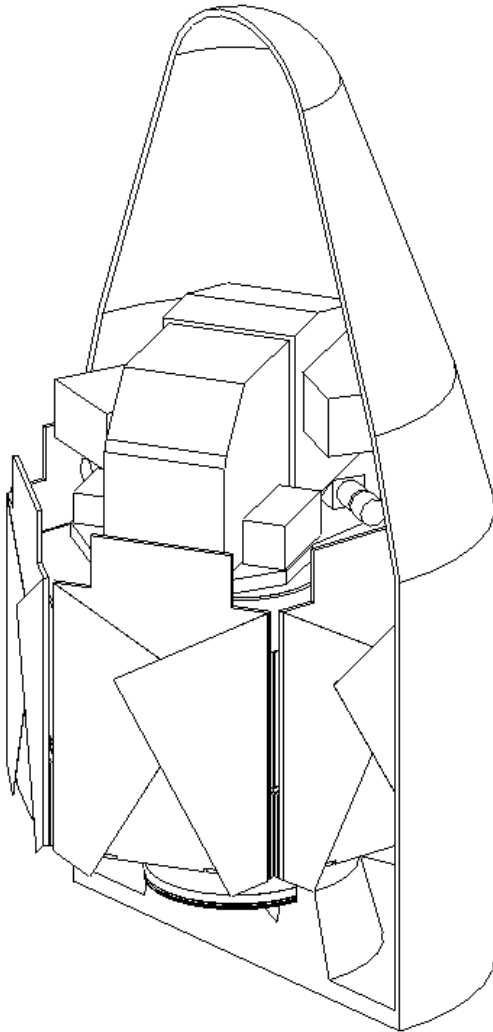
- **Requirements**
  - **Mechanical Interface**
  - **Volume Interface**
  - **Mechanical Environmental Loads**
  - **20+-2 Degree Celsius Conduction and TBD Radiation Thermal Interface**
  - **Stability of TBD Degree Celsius per Minute Thermal Interface**
  - **Location Plus Mechanical and Thermal Interfaces for Omni Antenna**
  - **Location Plus Mechanical and Thermal Interfaces for Star Trackers**
  - **Align Instrument to Bus at System Integration**
  - **Instrument Mass Allowable**
  - **Low Jitter Platform of TBD**
  - **Environmental Loads: Manufacturing, Transportation, Testing, Launch, and On-Orbit**
  - **Location for Spin Balance Masses for System Testing or Spin Balance Instrument Prior to System Integration**



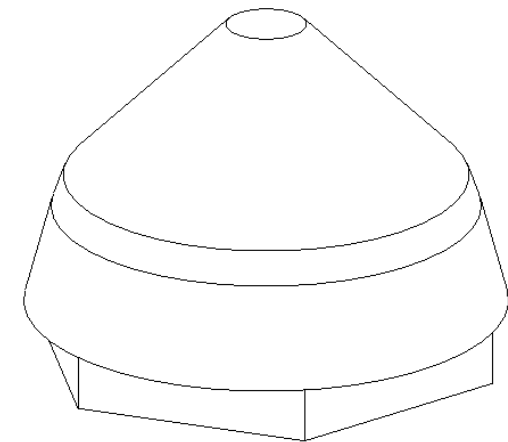
# Current Baseline/Approach



- **Current Baseline Design (Two Hinge Design)**



**Exploded View**



**Control Volume**



# Trade Studies



- **Three Point Mechanical Interface Trade**
- **Volume Interface Trade**
- **9.5 ft or 10.0 ft Fairing Trade**
- **Omni Antenna Location Trade**
- **Star Tracker Location Trade**
- **CCD Radiator Location Trade**
- **Spin Balance Trade**



# Issues



- **Instrument Mass**
- **Instrument Volume**



# Top Level Schedule



	FY00				FY01				FY02				FY03				FY04				FY05			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>Design Trades</b>			9/00					5/01																
<b>SRR</b>								△ 11/00																
<b>PDR</b>								△ 5/01																
<b>Instrument/Bus ICD</b>			9/00					5/01																
<b>CDR</b>												△ 2/02												
<b>Instrument I&amp;T</b>											7/02					7/03								
<b>Verify Requirements</b>											9/02					10/03								
<b>Delivery Instrument</b>																△ 7/03								
<b>System I&amp;T</b>														9/03									2/04	

Mech Sched.ai



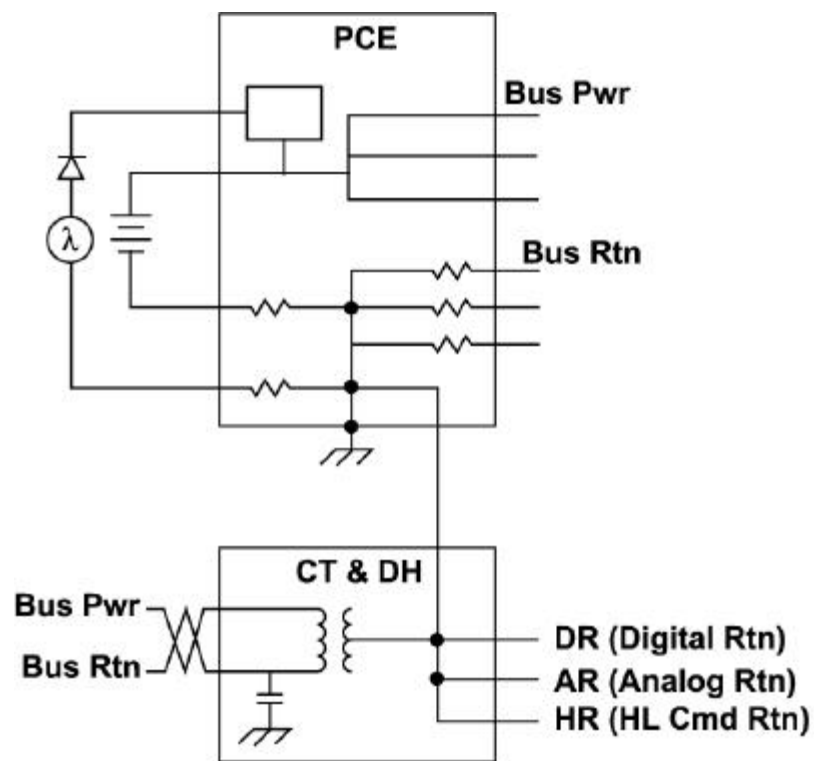
# Spacecraft to Instrument Electrical Interfaces

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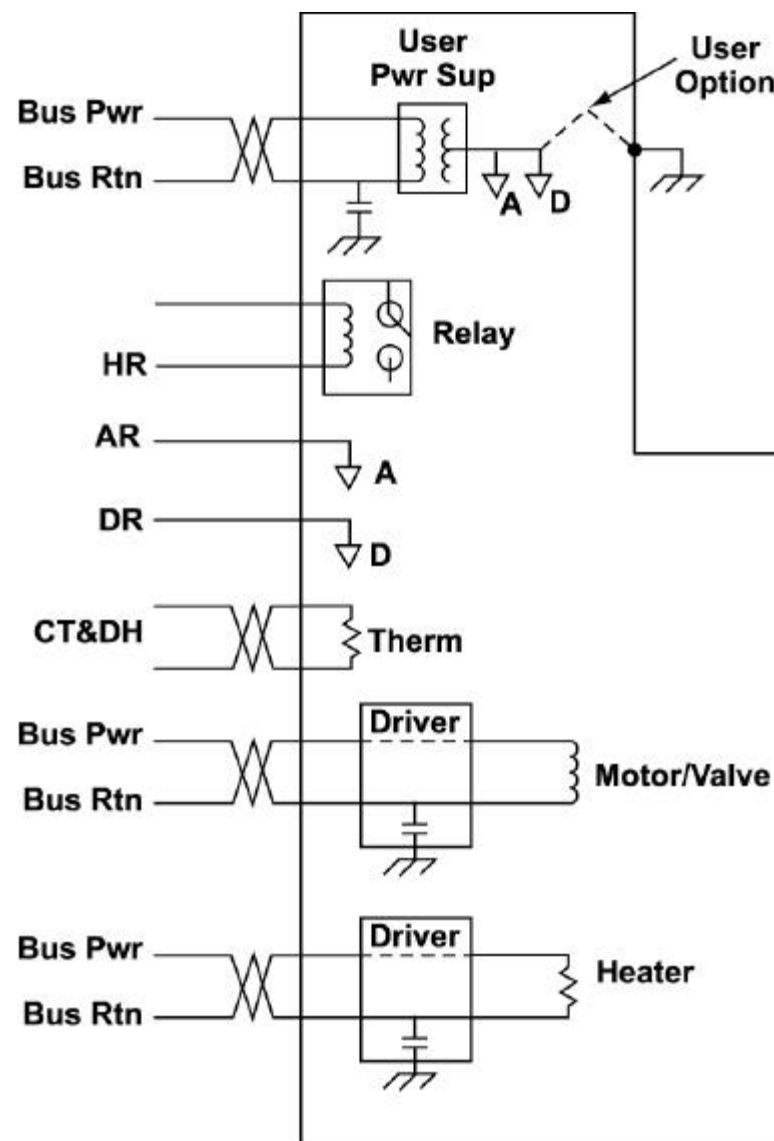




# FAME I/F Grounding



1. Bus Return Connected to Structure at PCE Only
2. AR, DR, HR Connected to Structure via CTDH
3. HR Never Connected to Structure at User
4. AR, DR Optionally Connected to Structure at User



grounding.ai



# Spacecraft to Instrument Power I/F



- **Primary Power**
  - Voltage  
2 Each (TBD)  
Spacecraft Bus Power at 30+TBD,-6VDC, Returns to Spacecraft Single Point Ground
  - Power  
TBD (Amps) per Feed
  - Switching  
Provided by Spacecraft Power Control Distribution Electronic (PCDE)
  - Fault Protection  
TBD Provided by Spacecraft PCDE
  - Inrush Current Limit Settle  
Limited to Twice the Average Input Operating Current and Shall to Within 10% of Nominal Operating Values Within 200 Milliseconds After the Application of Power
- **Secondary Power**  
None
- **Isolation**  
Primary Input Power and Returns Shall Be Isolated From the Case (Chassis) and Secondary Power Circuitry by a Minimum DC Resistance of 1 Megohm
- **Bonding/Grounding**  
Shall Be in Accordance With MIL-B-5087
- **Structure Grounding**  
Instrument Structure Shall Be Electrically Grounded to the Spacecraft Bus With Ground Straps Provided by NRL
- **Bonding**  
DC Impedance Shall Be  $\leq 2.5 \text{ m}\Omega$  for Metal to Metal Surface,  $\leq 10 \text{ }\Omega$  for Metal to Composite Interfaces
- **EMI/EMC**  
MIL-STD-461 CS01, CS-02, CS-06, CE-01 and CE-03, RS (TBD per Range Requirements)



# Instrument Power @ 28V



<u>Component</u>	<u>Operational</u>	<u>Transfer Orbit</u>	<u>Survival</u>
<b>Focal Plane Assembly</b>	<b>6</b>	<b>0</b>	<b>0</b>
<b>Analog Processing Electronics</b>	<b>15</b>	<b>0</b>	<b>0</b>
<b>CCD Control Electronics</b>	<b>26</b>	<b>0</b>	<b>0</b>
<b>Data Processing &amp; Instrument Control*</b>	<b>50</b>	<b>0</b>	<b>0</b>
<b>Focal Plane Heaters</b>	<b>2</b>	<b>0</b>	<b>0</b>
<b>Instrument Heater</b>	<b>80</b>	<b>0</b>	<b>0</b>
<b>Survival Heaters</b>	<b>0</b>	<b>20</b>	<b>60</b>
<b>Total Power</b>	<b>179</b>	<b>20</b>	<b>60</b>
<b>Contingency</b>	<b>90</b>	<b>10</b>	<b>30</b>
<b>Design Limit</b>	<b>269</b>	<b>30</b>	<b>90</b>



## Spacecraft to Instrument Command & Telemetry Interface



- **1553 I/F for Command and Most Housekeeping Data**
- **2 Redundant Busses Controlled by the S/C**
- **Command I/F**
  - Time Updates
  - Star Tracker Attitude
  - Active Heater Temperature Setpoints
  - Star Catalog Updates
  - Flight Software Patches
  - Special Test Modes
- **Housekeeping Data Interface**
  - Temperatures
  - Voltage/Current Monitors
  - Command Status Information
  - Attitude and Spin Rate
  - Rate
    - 1 per Second



# Spacecraft to Instrument Analog Telemetry Interface



- **Temperature Measurements (6 TBR)**
- **Voltage Monitors (4 Per Side / 8 Total TBR)**



# Spacecraft to Instrument Mission Data Interface



- **Science Data Sent on High Speed (TBD) Link**
- **HSS Operates at Rates From 0.5 to 20 Megabits/sec**
- **Expected Data Rates**
  - **Outside Galactic Plane**
    - **817 Stars/sec = 263 Kilobits/sec**
  - **In Galactic Plane**
    - **Number of Stars in Star Catalog Filtered to Keep Rate  $\leq$  400 Kilobits/sec**